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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/727,813	12/04/2003	Chris Boyer	LYNN/0165	7457

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EXAMINER	
WILLIAMS, SHERMANDA L	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 03/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/727,813	BOYER ET AL.	
	Examiner	Art Unit	
	Shermanda L. Williams	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *04 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-68* is/are pending in the application.

4a) Of the above claim(s) *33-68* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

FUEL CELL WITH RECOMBINATION CATALYST

Examiner: Williams S.N. 10/727,813 Art Unit: 1745 February 27, 2006

Election/Restrictions

This application contains claims directed to the following patentably distinct inventions:

I. Claims 1-32 are drawn to a hydrogen-oxygen fuel cell comprising a hydrogen-oxygen recombination catalyst disposed in the hydrogen distribution system, the oxygen distribution system, or a combination thereof. Classified in class 429, subclass 012.

II. Claims 33-42 are drawn to a hydrogen-oxygen fuel cell comprising a hydrogen-oxygen recombination catalyst disposed on one or more of the flow fields. Classified in class 429, subclass 012.

III. Claims 43-68 are drawn to a hydrogen-oxygen fuel cell comprising a hydrogen-oxygen recombination catalyst disposed in one or more of the chambers. Classified in class 429, subclass 012.

Inventions I, II and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different designs, modes of operation, and effects (MPEP § 802.01 and § 806.06). In the instant case, the different inventions are distinct due to their different modes of operation. Within each invention, the recombination catalyst is introduced by a different method.

Because these inventions are independent or distinct for the reasons given above and the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

During a telephone conversation with Mr. Jeffrey Streets of Streets and Steele on January 19, 2006 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-32. Applicant in replying to this office action must make affirmation of this election. Claims 33-68 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

Claim 3 objected to because of the following informality: the spelling of perfluoronated sulphonic acid should be perfluoronated sulfonic acid. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 3, 7, 8, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. (US 2004/0053085) in view of Meltser et al. (US 6,265,092). Smedley et al discloses a hydrogen management system for a fuel cell, which employs recombination catalyst to manage hydrogen and oxygen levels in the fuel cell system. Smedley et al. discloses a fuel cell system comprising recombination catalyst 224, 226 located in the vent or exit flow field 210 of the hydrogen and/or the oxygen exit flow filed 212. See Figure 3. The exhaust surfaces of the hydrogen and oxygen distribution systems are in contact with the recombination catalyst. Meltser et al. teaches that the typical structure of a hydrogen-oxygen fuel cell comprises a proton electrode membrane (PEM) having perfluoronated sulfonic acid polymer as the ionic conducting media. See Column 1 Line 20-56. It would have obvious at the time of the

invention for one having ordinary skill in the art to combine the teachings of Smedley and Meltser et al. to form a hydrogen-oxygen fuel cell containing a recombination catalyst in the hydrogen or oxygen distribution system having a perfluoronated sulfonic acid polymer PEM. The motivation to combine these teachings would be to prevent the build up of hydrogen in the oxygen stream or vice versa due to the possible catastrophic results of such an accumulation. The utilization of a perfluoronated sulfonic acid polymer allows for increased energy from a low weight cell as taught by Meltser et al. (Column 1 Line 22).

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meltser et al. (US 6,265,092) in view of Smedley et al. (US 2004/0053085). Smedley discloses a hydrogen management system for a fuel cell. The reference teaches the use of elemental metal particles, metal composition and combinations thereof as the recombination catalyst for hydrogen recombination to form water. (See Paragraph 40) Suitable metals broadly cover all recognized metal elements of the periodic table and alloys thereof. Examples such as platinum and palladium are given. Gold and tin are included in the metals of the periodic table. Therefore it would have been obvious to one having ordinary skill in the art to choose platinum, palladium, gold, tin, or a combination thereof as the recombination catalyst due to their ability elemental oxidization state. These elemental metals are very suitable for the oxidation of hydrogen due to their un-oxidized nature in their zero oxidation state.

Claims 6, 10, and 11, 21, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. in view of Meltser et al. and further in view of Kurzweil

et al. (US 5,955,215). (Smedley et al. and Meltser et al. are discussed above.) Kurzweil et al. discloses a bipolar electrode-electrolyte unit for an electrochemical cell. This reference teaches the use of polymers or binders as adhering and/or bonding agents. (See Column 5 Line 50). Also, the use of polytetrafluoroethylene as a binding material and its application to a given surface by spraying, painting (or spreading), dipping, sintering, or silk-screen methods is disclosed. (See Column 5 Lines 50-58) It would have been obvious to one having ordinary skill in the art at the time of the invention to use a bonding agent to adhere the recombination catalyst to the surface of the hydrogen or oxygen distribution system. Adhering the recombination catalyst to the surface of the oxygen or hydrogen distribution system ensures proper contact between the reactants and the recombination catalyst.

Claims 8, 10, 11, 19, 21, 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. (US 2004/0053085) in view of Meltser et al. and further in view of Kurzwelll et al. (US 5,955,215). Kurzwell et al. discloses a biopolar electrode-electrolyte unit for an electrochemical cell. Kurzwell et al. discloses a biopolar plate having several layers to include an electrolyte layer containing a palladium salt as a recombination catalyst for hydrogen and oxygen. See Column 6 Line 40-44. The use of polytetrafluoroethylene as a binding or holding material for the electrolyte containing the recombination catalyst is taught. (See Column 6 Line 8-26) It would have been obvious to one having ordinary skill in the art at the time of the invention to apply the recombination catalyst to the biopolar plate of the fuel cell. Adhering the recombination catalyst to the surface of the bipolar electrode-electrolyte unit improves conductivity and

electrochemical activity thereby producing an electrochemical cell with a high energy and power density.

Kurzwell teaches the mixing of a binding agent with an electrolyte to promote adhesion to a given surface. Furthermore, Kurzwell teaches the addition of the recombination catalyst to the binder and electrolyte mixture. Kurzwell also discloses the application of the mixture as a paste or paint. See Column 6 Lines 1-7, 26-30, and 40-44. It would have been obvious to one having ordinary skill in the art at the time of the invention to apply the recombination catalyst mixture by spreading, spraying, dipping, or any combination thereof.

Claims 8 and 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. (US 2004/0053085) in view of Meltser et al. and further in view of Buzzelli et al. (US 5,563,004). Buzzelli et al. discloses a rechargeable metal-air electrochemical cell with hydrogen recombination and end-of-charge indicator. The Buzzelli discloses a current collector adhered to an active layer of a recombination catalyst of a recombination electrode. The hydrogen-oxygen recombination catalyst layer contains polytetrafluoroethylene as a binder. (See Column 6 Lines 35-49) It would have been obvious to one having ordinary skill in the art at the time of the invention to adhere the recombination catalysts to the current collector surface to increase the level of control over the hydrogen gas production, to control the water loss from the cell, and to improve performance of the electrochemical cell.

Claim 9 and 20 rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. (US 2004/0053085) in view of Meltser et al. and further in view of

Buzzelli et al. (US 5,563,004). Buzzelli et al. discloses a recombination electrode (recombination catalyst present) connected to the cathode electrode such that during discharge mode the recombination electrode is inactive. The recombination electrode is active during the recharge mode to catalyze the hydrogen and oxygen reaction. (See Column 12 Lines 16-26) It would have been obvious to one having ordinary skill in the art at the time of the invention to provide the fuel cell with a recombination catalyst that will not interfere with the electrical components of the fuel cell during discharge operation. The inactive nature of the recombination catalyst during the cell discharge allows for maximum power production and discharge without interference by the catalyst.

Claims 12, 13, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. (US 2004/0053085) in view of Meltser et al. and further in view of Buzzelli et al. Buzzelli et al teaches the metal-to-metal bonding of the anodic layer and the current collector. (See Column 4 Lines 1-14) The flow field of the cell is through the metal mesh anode layer. The anodic layer is an expanded perforated or mesh layer bonded to the current collector via a metal-to-metal bond. (See Column 3 Lines 58-67) The exit flow path for the hydrogen gas produced at the anode is through the anodic layer (expanded metal mesh) and the current collector (mesh). (See Column 8 Lines 57-65). It would have been obvious to one having ordinary skill in the art at the time of the invention to have the flow field material be expanded metal mesh and the attachment means between the anode layer and the current collector to be a metal-to-metal bond. The expanded metal mesh of the anode allows the hydrogen gas

to flow away from the anode. The meta-to-metal bonding allows for electrical communication between the anode and the current collector without interference or hindrance.

Claims 14, 16, 25, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al., Meltser et al., Buzzelli et al. and further in view of Cisar et al. (US 2003/0003343). Cisar et al. discloses a method for bonding subcomponents of an electrochemical cell. The subcomponents bonded are plates, shims, frames, flow fields, or combinations thereof. (See Paragraph 11) The metal-to-metal bonding method using soldering is taught as a well known technique. (See Paragraph 41) It would have been obvious to one having ordinary skill in the art at the time of the invention to use soldering as a method to form the metal-to-metal bond. The use of soldering for formation of the metal-to-metal bonds allows use of low temperature melting metal for the adhering of metal components together.

Cisar et al. also teaches the use of conducting adhesives for joining metal components such as a flow field, endplate, or combinations thereof. For example, Pd-Ag filled epoxy is given as a conducting adhesive that may be used in the construction of a fuel cell. (See Paragraph 11 and 52) It would have been obvious to one having ordinary skill in the art at the time of the invention to employ the teachings of Cisar to bond the flow field to the biopolar plate, endplate, or current collector of the cell with a conducting adhesive material. This bonding method eliminates the need for certain gaskets and reduces or eliminates certain electronic contact resistances.

Claims 15 and 26 are product-by process claims. Even though product-by-process claims are limited by and defined by the process, determination of the patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. See *In re Marosi, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983)* and *In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985).* Since the combination of Smedley et al., Meltser et al., Buzzelli et al. and Cisar et al. produces a product like that of the applicant, the applicant's process is not given patentable weight in these claims. (See discussion on claims 14 and 24 above.)

Claims 17 and 28 are product-by process claims as discussed above. Since the combination of Smedley et al., Meltser et al., Buzzelli et al. and Cisar et al. produces a product like that of the applicant, the applicant's process is not given patentable weight in these claims. (See discussion on claim 16 and 27 above.)

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. in view of Meltser et al. Please see discussion above. Smedley discloses that the oxygen source for the fuel cell can be ambient or outside air. (See Paragraph 17) It would have been obvious to one having ordinary skill in the art at the time of the invention to supply outside air through the oxygen or air distribution system to the reaction site. The use of air as the oxygen source alleviates the need for maintaining a separate oxygen supply container.

Claims 30, 31, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. in view of Meltser et al. (as discussed above for claim 1). Claims 30, 31, and 32 are method of operation claims and are not being given patentable weight due to the fact that claim 1 does not declare a method of operation. All structural limitations of claims 30, 31, and 32 have been addressed in the rejection of claim 1. The ability to operate the oxygen and hydrogen distribution systems of the fuel cell of claim 1 above or below atmospheric pressure as well as the ability to operate the two distribution systems at different pressures is possessed by the prior art.

Claims 31, and 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smedley et al. in view of Meltser et al. and further in view of Oyanagi et al. (US 6,986,962). Smedley and Meltser are discussed above. Oyanagi et al. discloses a basic polymer electrolyte fuel cell operated in such a manner that the pressure of the oxygen gas supply is higher than the hydrogen gas supply. (See Abstract and Column 13 Lines 11-30) The hydrogen distribution system is operated at 200 kilopascals and the oxygen distribution system is operated at 300 kilopascals. Both of these operating pressures are above one atmosphere or 101.325 kilopascals. This calls for the fuel cell oxygen and hydrogen distribution systems to be operated at different pressures. This method of operation (having a higher pressure at the anode electrode) accelerates the chemical reaction between the hydrogen ions, electrons, and the oxygen at the cathode electrode to form water. (See Column 4 Lines 10-15, Column 2 Lines 12-19) This increases the energy efficiency of the cell and allows for a higher electrical output from the cell. It would have been obvious to one having ordinary skill in the art at the time of

the invention to operate the hydrogen and oxygen distribution systems at different pressures to improve the cell efficiency and increase its electrical output.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shermanda L. Williams whose telephone number is (272) 571-8915. The examiner can normally be reached on Mon.-Thurs. 7 AM - 4:30 PM and alternating Fridays 7 AM – 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (272) 571-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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TRACY DOVE
PRIMARY EXAMINER
3/04